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(54) **COLOR FILTER WITH DIFFERENT ALIGNMENT STRUCTURES AND DISPLAY PANEL USING THE SAME**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**
G02F 1/1337 (2006.01)
G02F 1/1343 (2006.01)

(52) **U.S. Cl.** **349/129**; 349/142; 349/143

(58) **Field of Classification Search** 349/129
See application file for complete search history.

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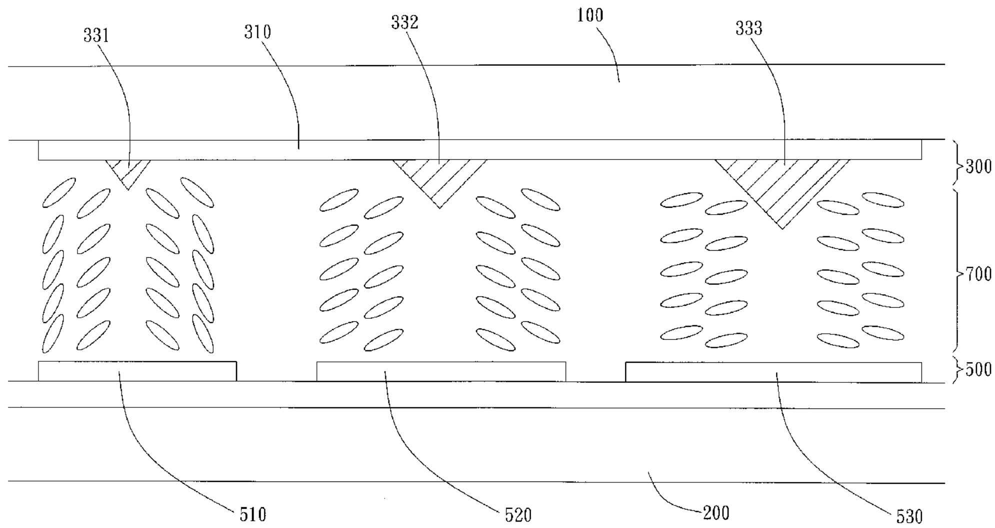
(57) **ABSTRACT**

A display panel and a color filter substrate thereof are provided. The display panel includes a first substrate, an alignment structure set, a second substrate, a pixel electrode, and a liquid crystal layer. The alignment structure set includes a first and a second alignment units disposed on the upper electrode. The first alignment unit is different from the second alignment unit. The pixel electrode is formed on the second substrate and includes a first electrode and a second lower electrode opposite to the first and second alignment units, respectively. A color filter may be disposed between the first substrate and the alignment structure layer to form a color filter substrate.

17 Claims, 12 Drawing Sheets



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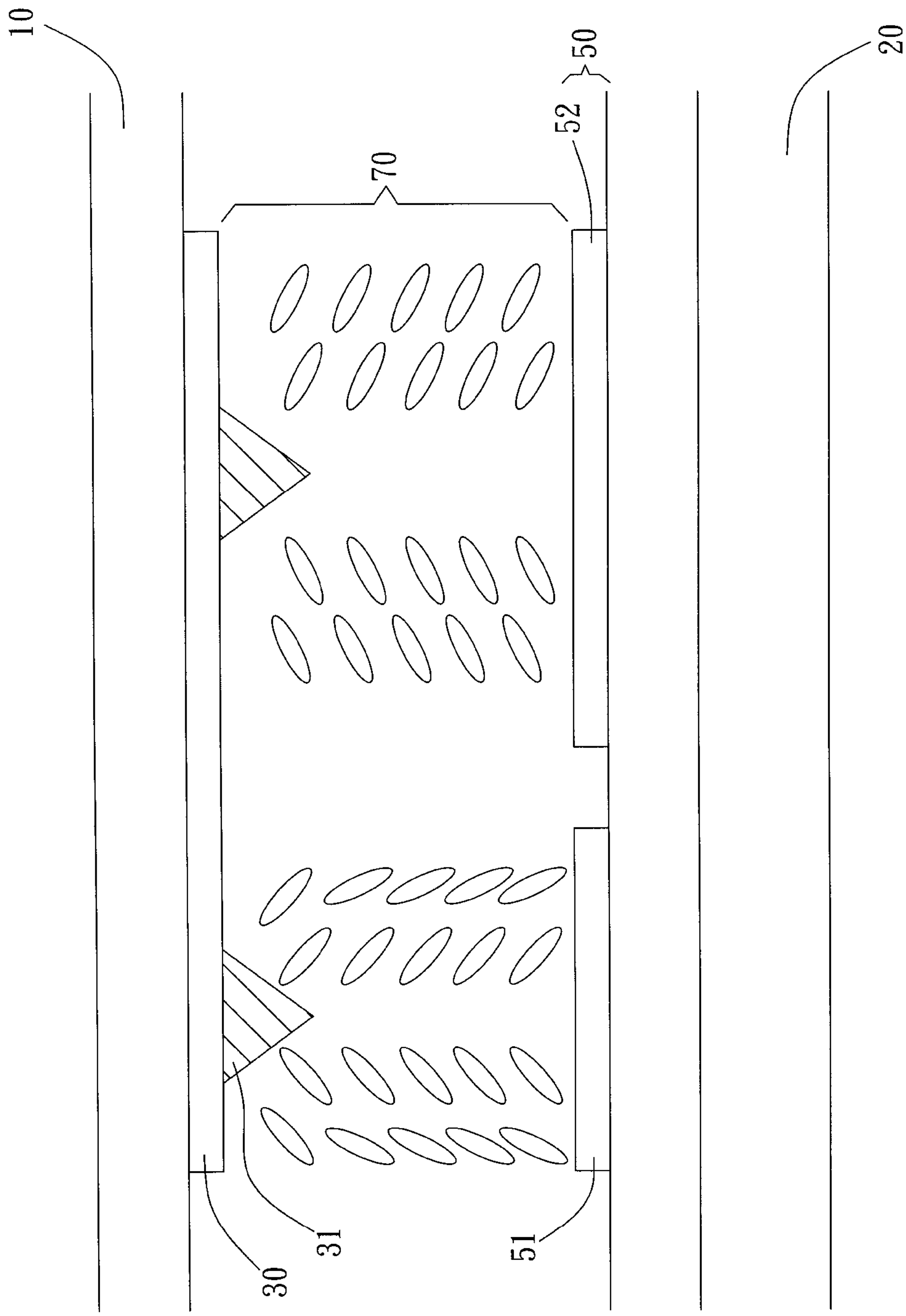

Fig. 1 (Prior Art)

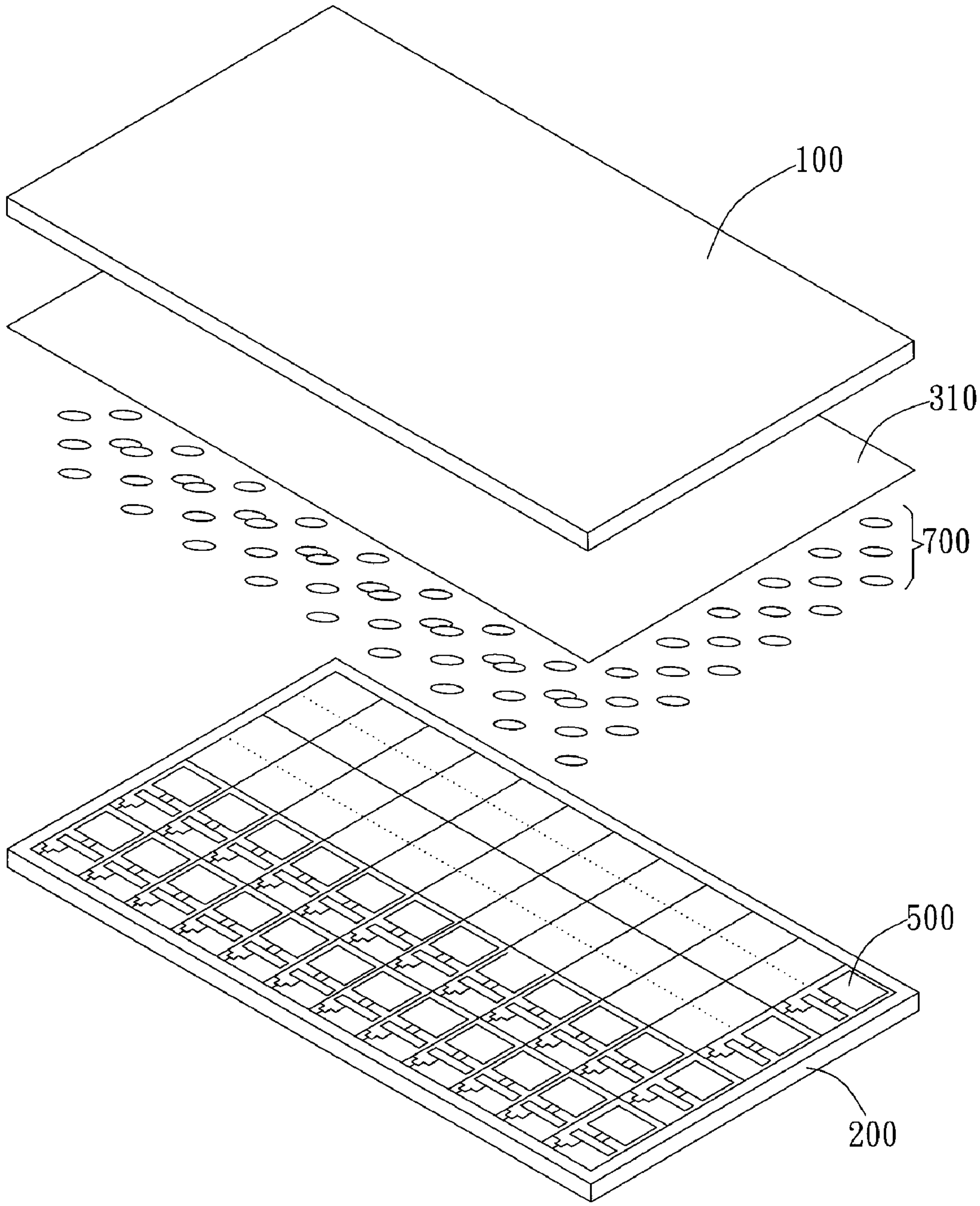

Fig. 2a

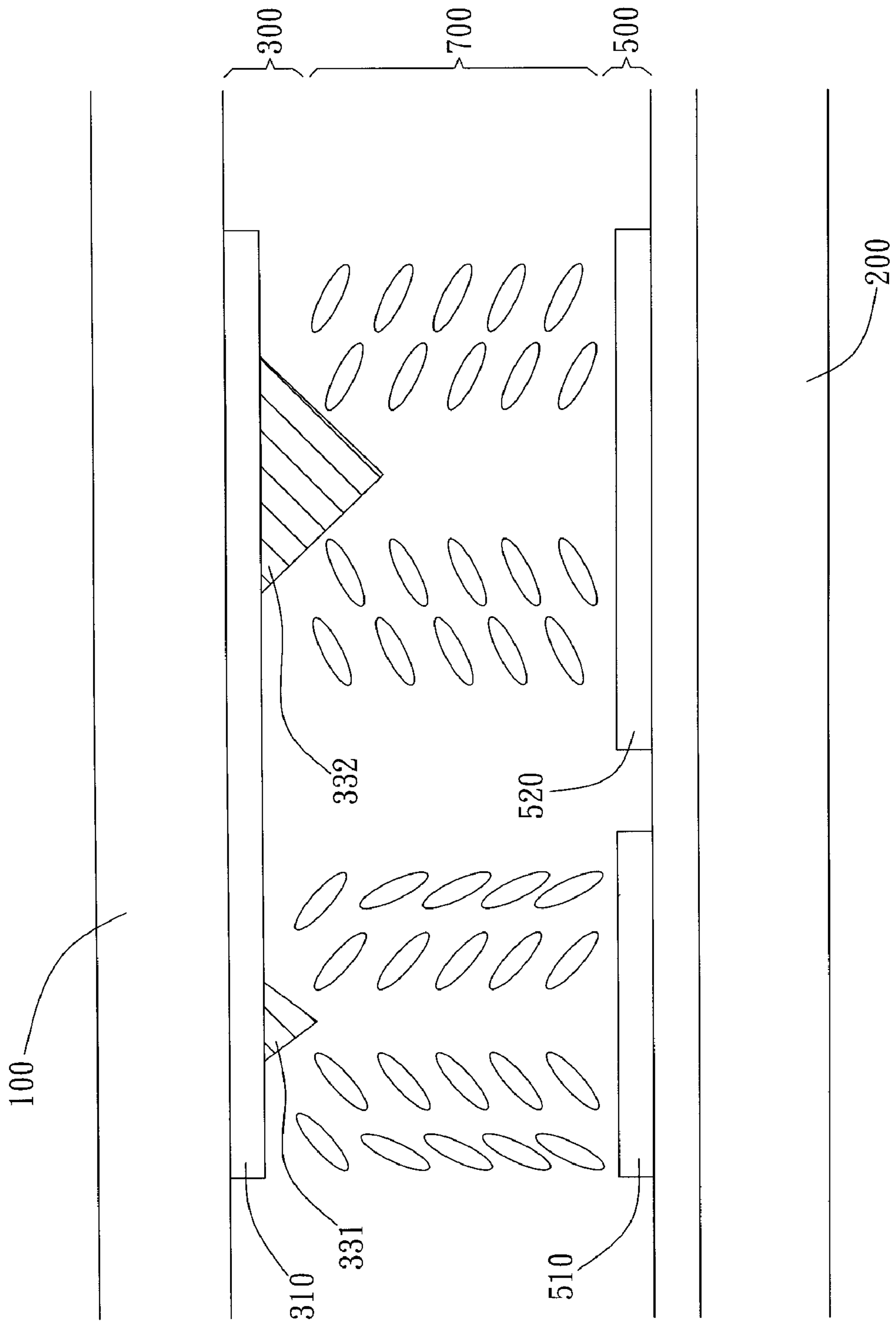

Fig. 2b

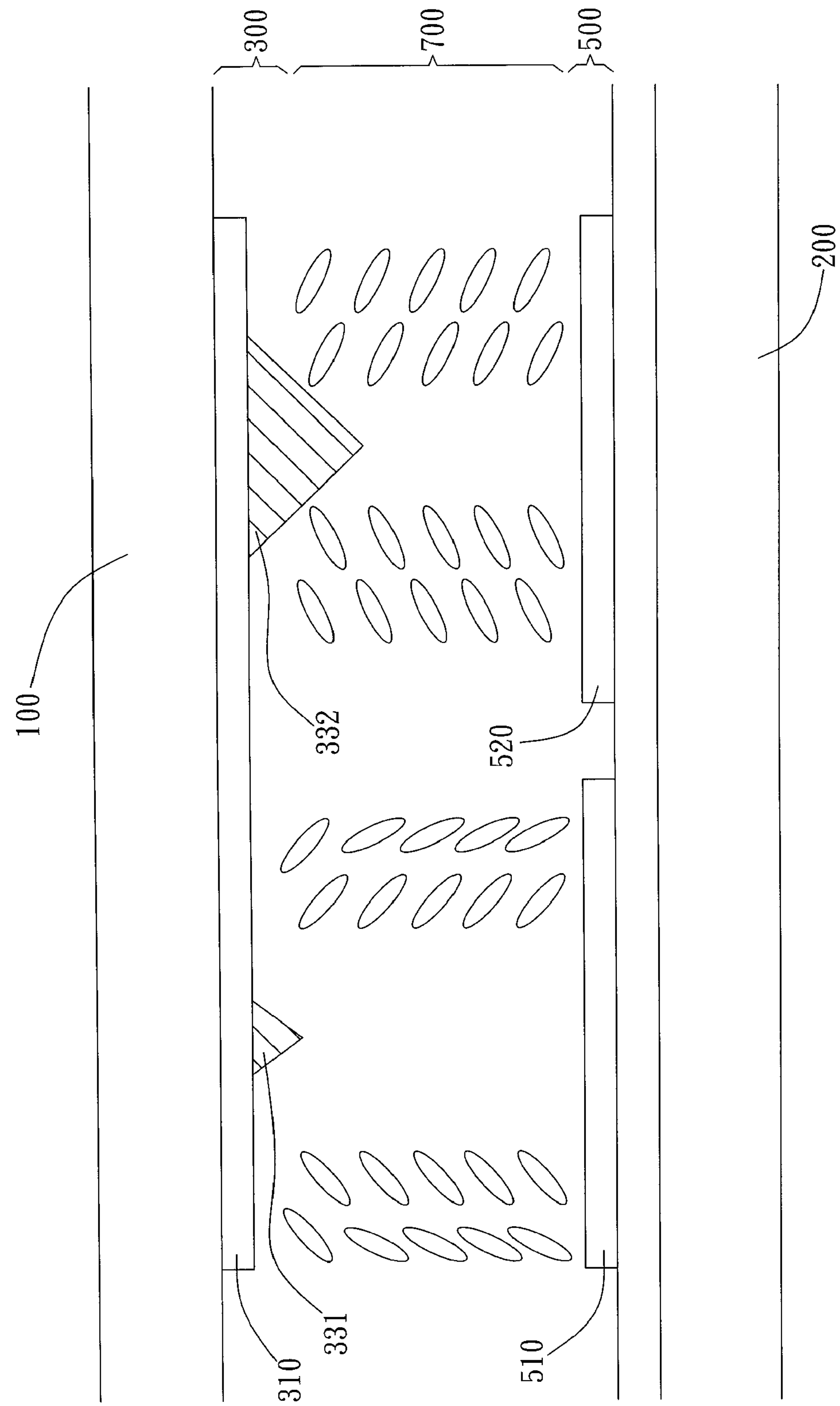

Fig. 2c

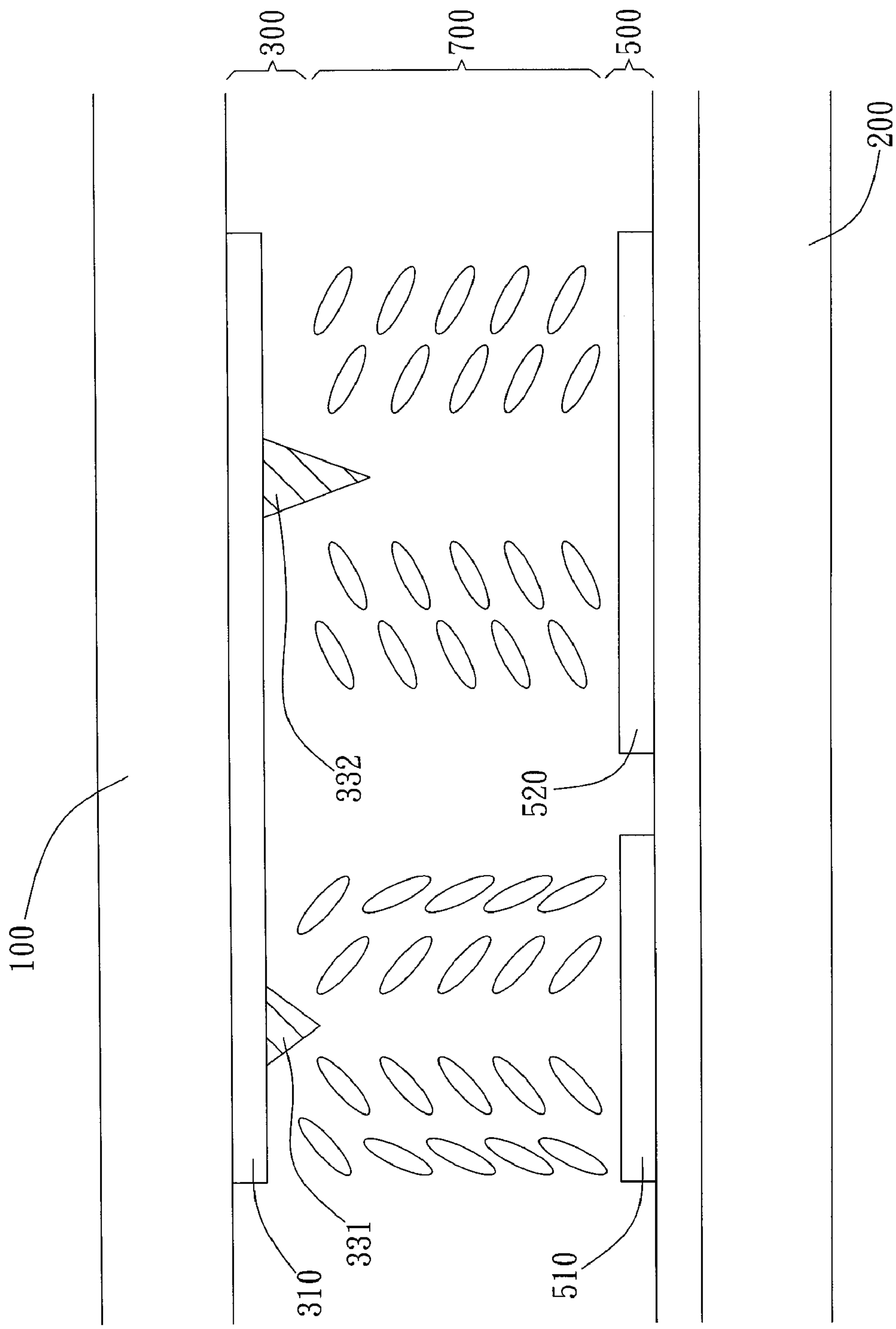

Fig. 3

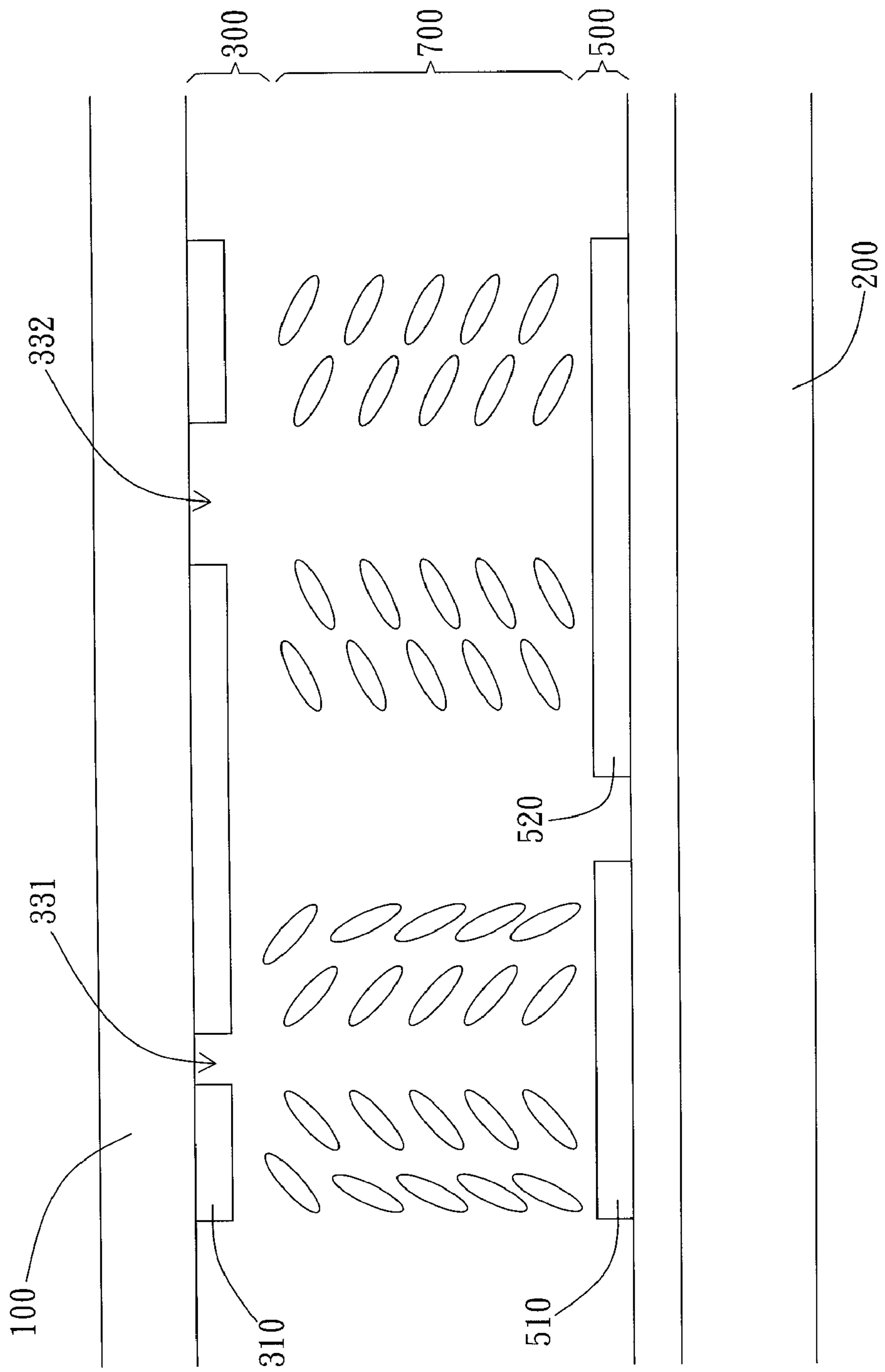

Fig. 4

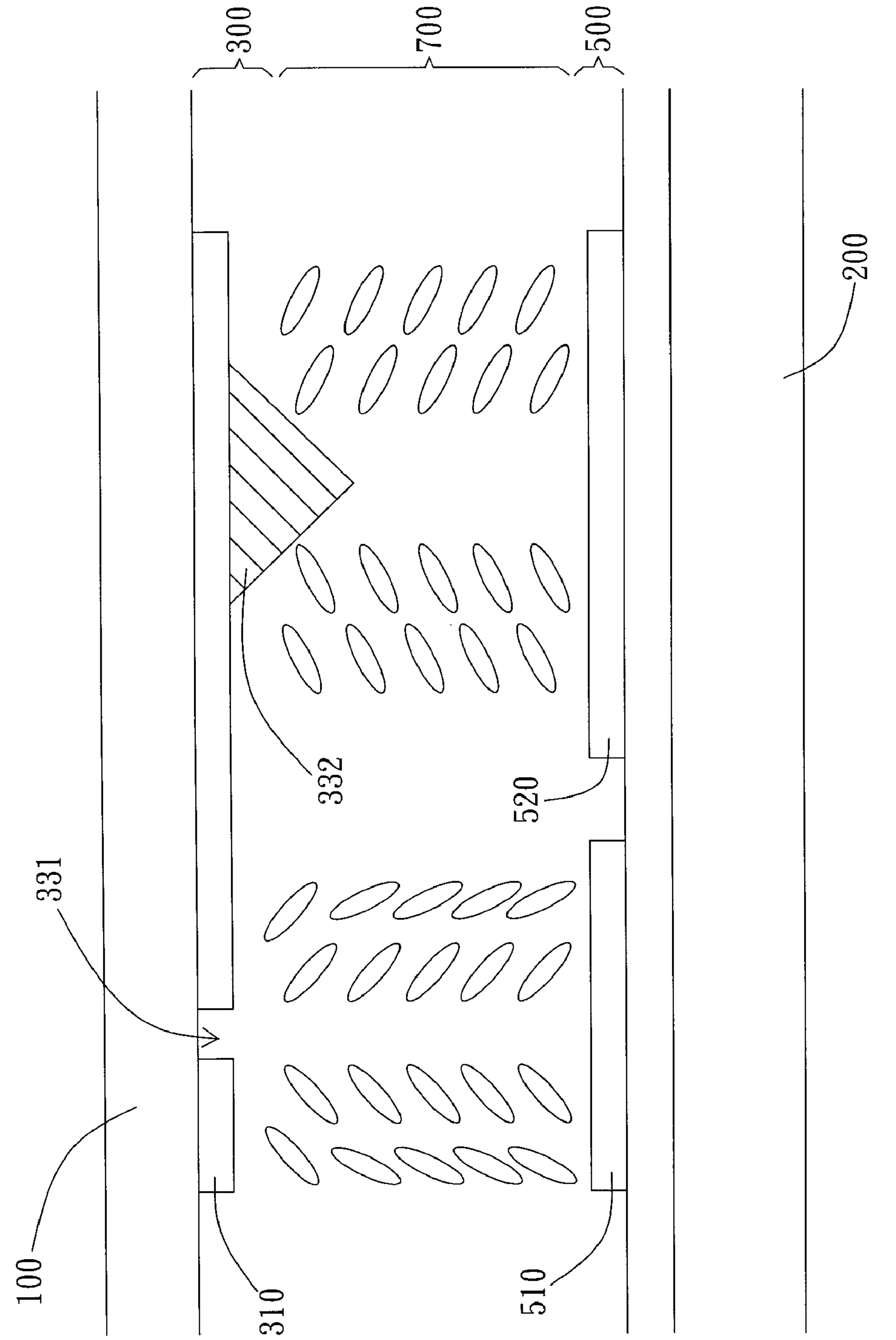

Fig. 5

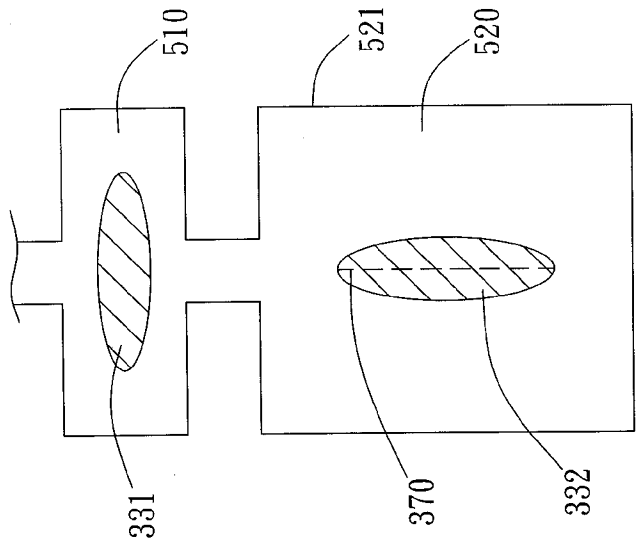

Fig. 6c

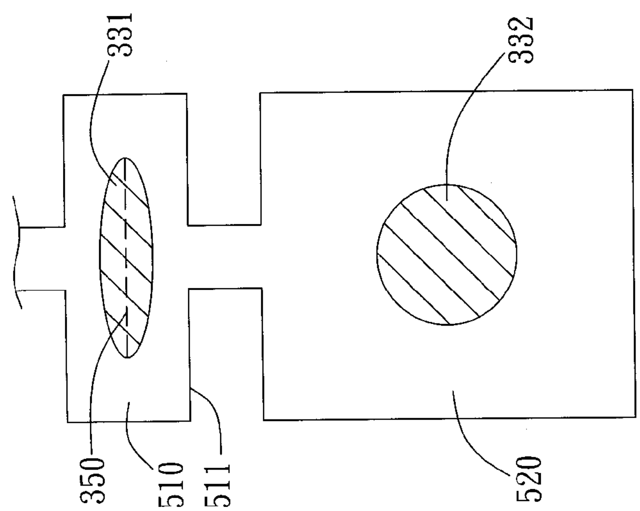

Fig. 6b

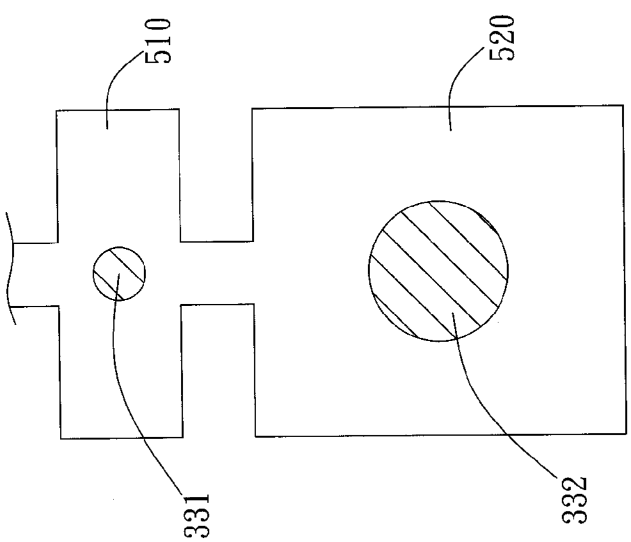

Fig. 6a

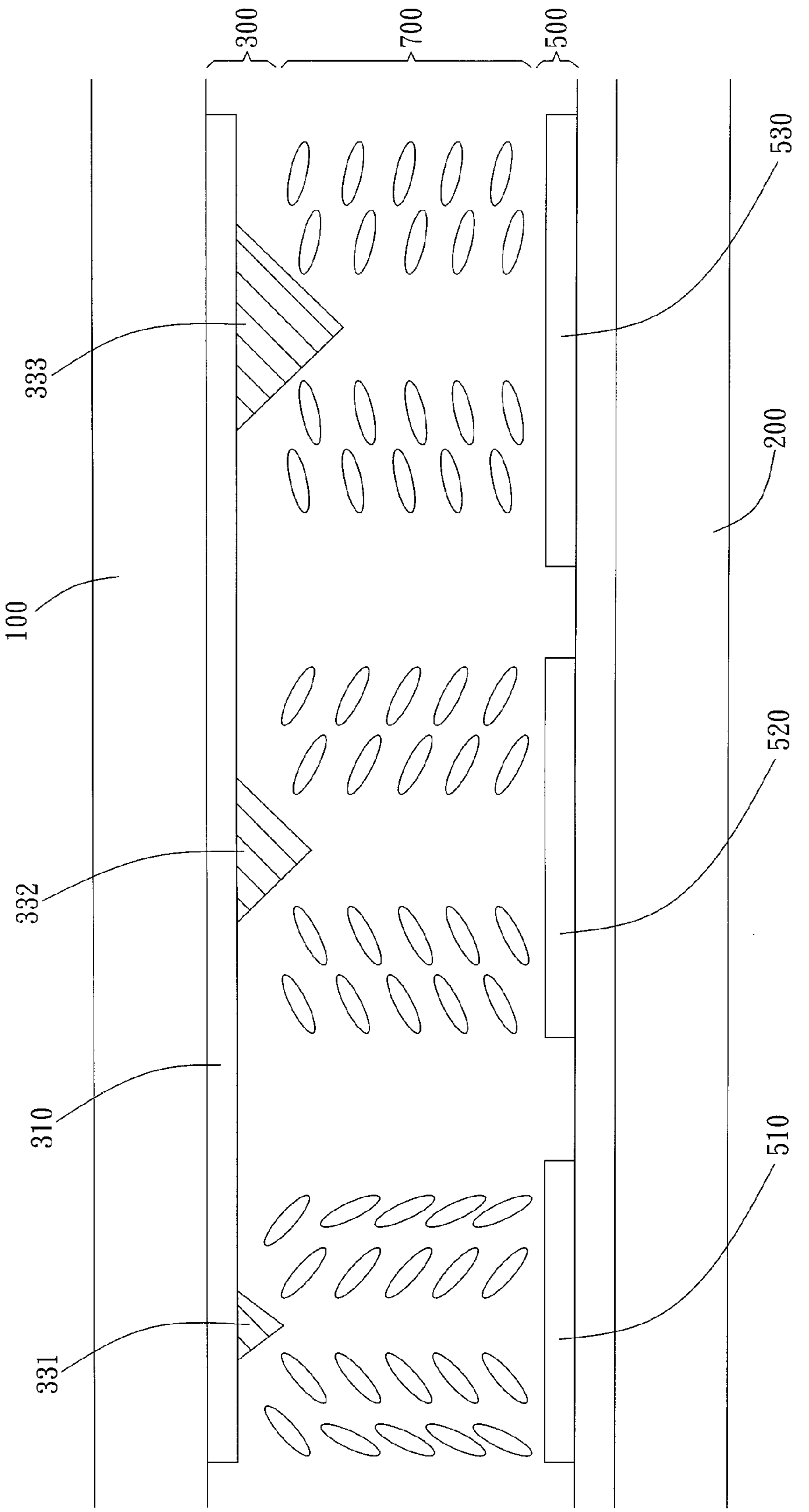

Fig. 7

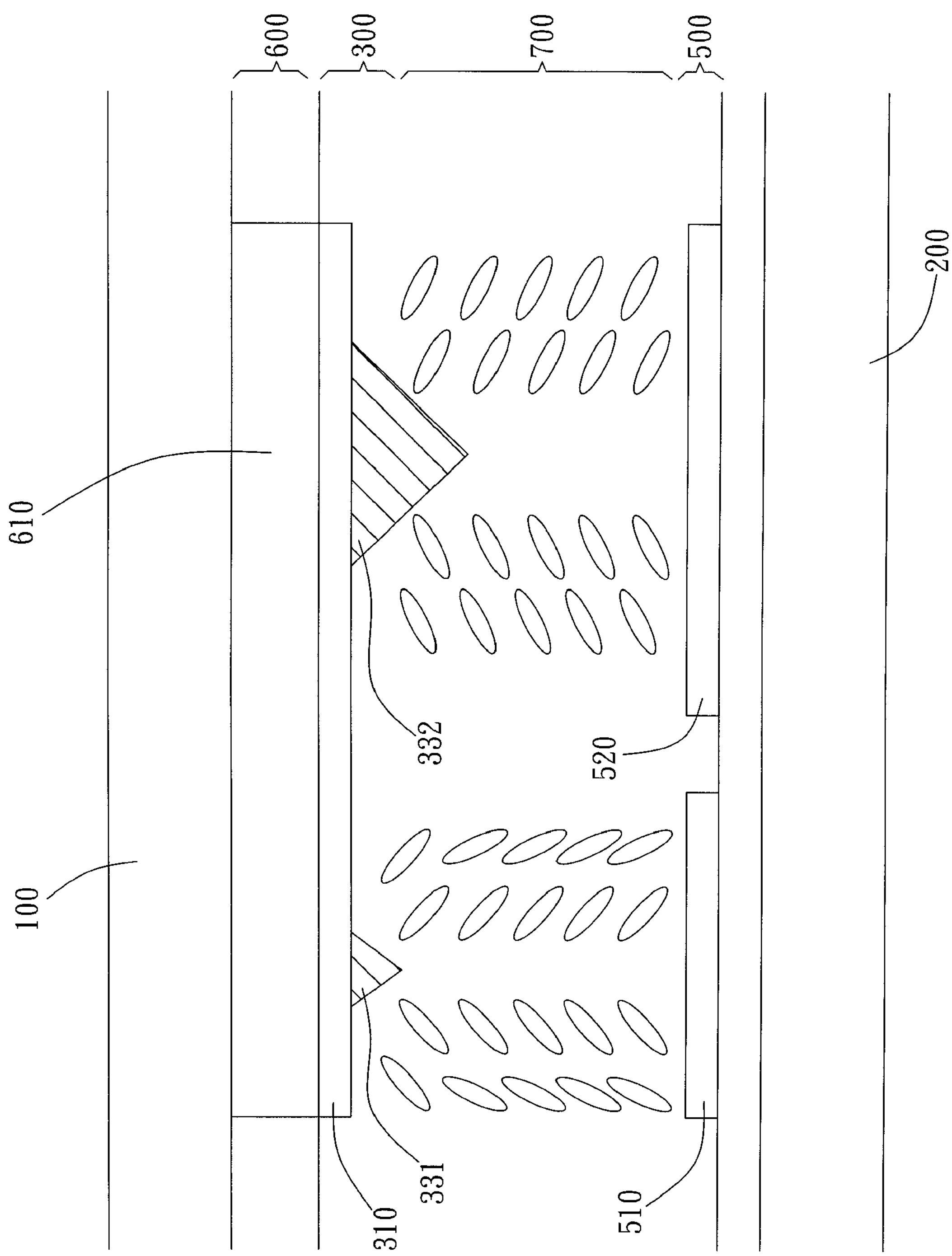

Fig. 8

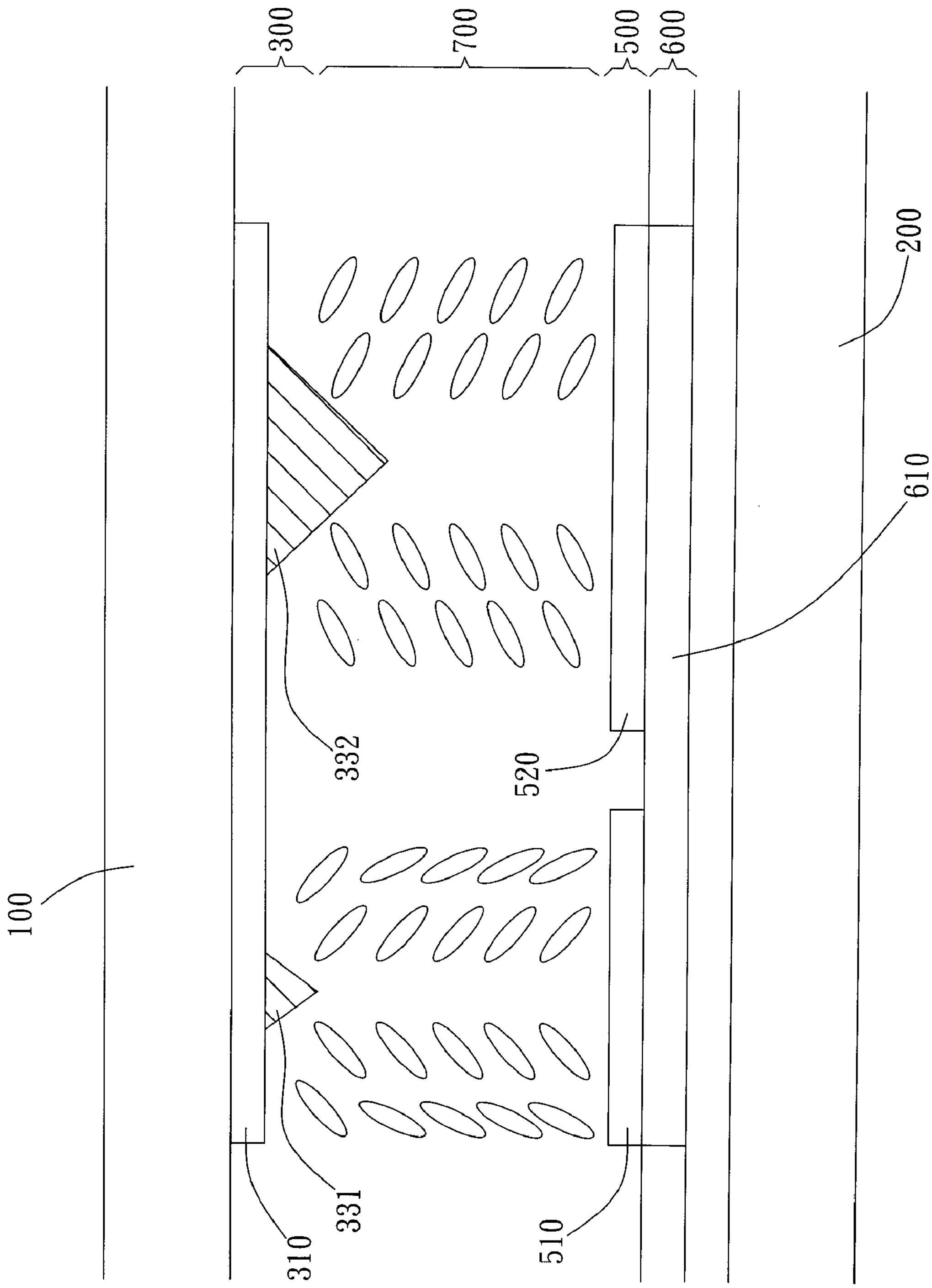

Fig. 9

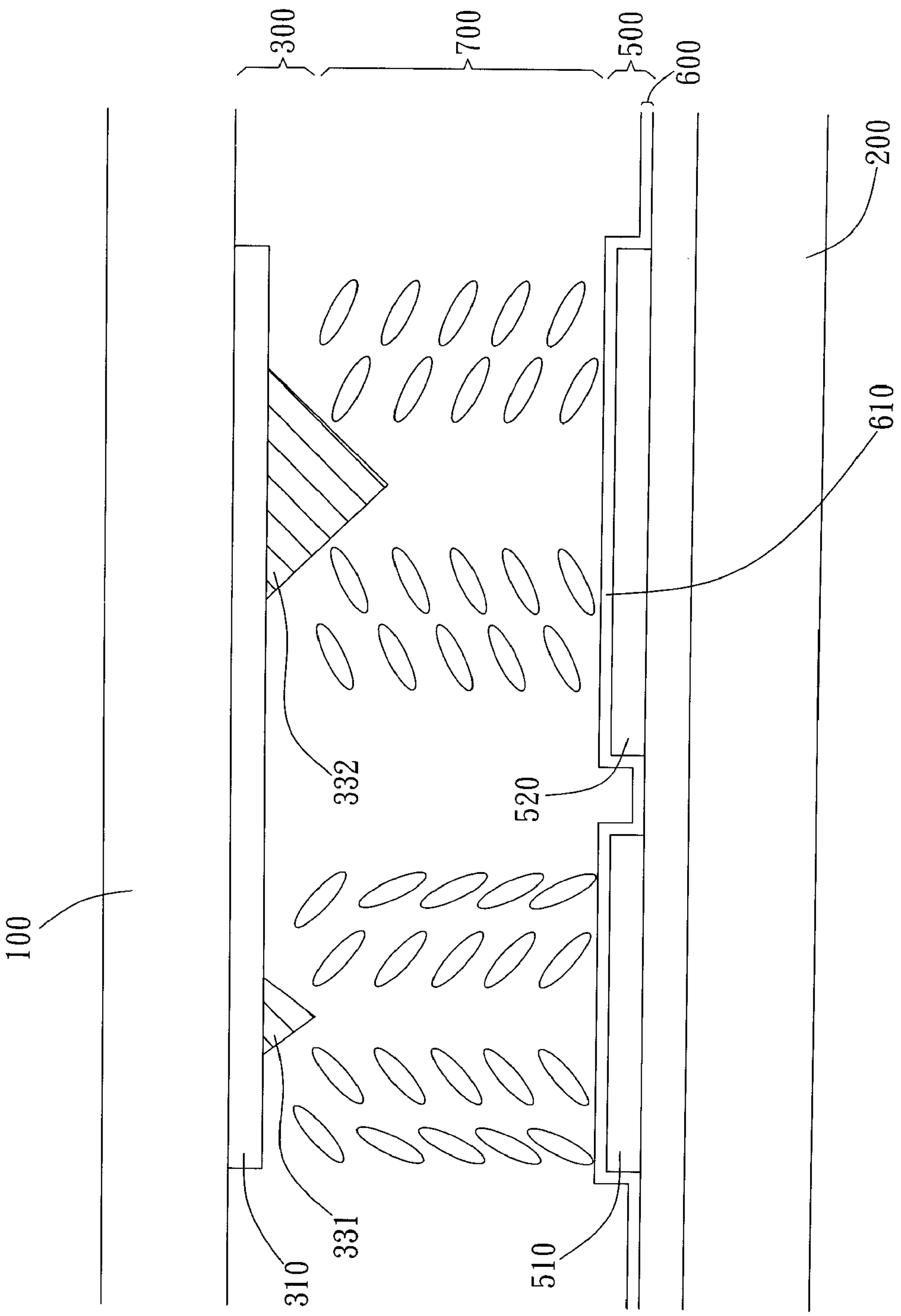

Fig. 10

COLOR FILTER WITH DIFFERENT ALIGNMENT STRUCTURES AND DISPLAY PANEL USING THE SAME

This application claims benefit to a Taiwanese patent application No. 096146319, filed on Dec. 5, 2007.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a color filter substrate and a display panel using the same. Particularly, the present invention relates to a color filter substrate and a display panel having different liquid crystal alignment structures.

2. Description of the Prior Art

Following improvement of technology, all of the standards of liquid crystal display (LCD) device also step forward to a new level. When consumers survey LCD devices, several elements including luminosity, reaction time, input/output interface, resolution, color gamut and viewable angle of the display panel always come into their mind. As for the viewable angle, due to physical nature of liquid crystal molecule of traditional LCD display panel, when viewers see the monitor from lateral sides of the display device instead of seeing the monitor from front side, the quality and the color of the output image is usually worse than that of the image from the front side.

In order to compensate this disadvantage, current LCD devices use a technology which simultaneously drives liquid crystal molecules in different ways by using two electrodes having different surface areas in the same pixel. As shown in FIG. **1**, LCD device includes a first substrate **10** and a second substrate **20**. The pixel electrode layer **50** is disposed on the second substrate **20**. In each of the pixel, pixel electrode layer **50** includes a first electrode **51** and a second electrode **52**. A common electrode layer **30** is disposed on the first substrate while the liquid crystal molecules **70** are filled into a space between common electrode layer **30** and pixel electrode layer **50**.

An alignment structure **31** is disposed on the common electrode layer **30**. Every alignment structure **31** protrudes toward the first electrode **51** or the second electrode **52**. Through the alignment structure **31**, the voltage difference between the pixel electrode layer **50** and the common electrode layer **30** drives the liquid crystal molecule **70** to twist different angles. Besides, because the surface areas of the first electrode **51** and the second electrode **52** are different, the twisting angles of the liquid crystal molecules **70** above both of the electrodes are different. In other words, in the same pixel, the liquid crystal molecules **70** are divided into two groups having different twisting angles. By this design, the quality and color of output image could be improved when viewers watch the monitor the lateral sides.

However, this design causes the decrease of the transparent area and the aperture ratio, since two or plural the same alignment structures are used. Even further, the decrease reduces the luminosity of whole panel and causes unequal luminosity between the first electrode **51** and the second electrode **52**.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a color filter substrate and a display panel having thereof so as to improve image luminosity.

It is another object of the present invention to provide a color filter substrate and a display panel having thereof so as to progress aperture ratio.

It is a further object of the present invention to provide a color filter substrate and a display panel having thereof so as to be able to flexibly adjust twisting angle of liquid crystal molecule.

The display panel includes a first substrate, an upper electrode, an alignment structure set, a second substrate, a pixel electrode and a liquid crystal layer. The first substrate is disposed corresponding to the second substrate. The alignment structure set, the pixel electrode and liquid crystal layer would be accommodated between the first substrate and the second substrate. The alignment structure set includes a first alignment unit and a second alignment unit. The upper electrode is disposed on one surface of the first substrate corresponding to the second substrate. The first alignment unit and the second alignment unit are formed on the upper electrode, respectively. These alignment units could be shaped in cone, cavity or other structure having the same function. The first alignment unit is distinct from the second alignment unit. For instance, both of the alignment units are different among several factors including volume, angle, structure, basic shape and so on.

The pixel electrode is formed on the second substrate and includes first lower electrode and second lower electrode, which series connects to each other. The distributing place of the first lower electrode is corresponding to the first alignment unit. In this case, the distributing place of the second lower electrode is corresponding to the second alignment unit. Liquid crystal layer is accommodated between the upper electrode and pixel electrode. By adjusting the potential difference between the upper electrode and the pixel electrode, the twisting angle of the liquid crystal molecules could also be adjusted. Because the surface areas of the first lower electrode and the second lower electrode of the pixel electrode are different, the twisting angles of the liquid crystal molecules, respectively, above the first lower electrode and the second lower electrode would be different. Furthermore, the structural difference between the first alignment unit and the second alignment unit also affects the twisting angle of the liquid crystal molecules. That also improves the aperture ratio of the display panel to enhance image luminosity.

A color filter layer is disposed on the first substrate to form the first substrate as color filter substrate. The color filter layer is accommodated between the first substrate and alignment structure set. The color filter layer includes at least one color unit. When the color unit is disposed on the first lower electrode and the second lower electrode, the color unit is disposed corresponding to the first alignment unit and the second alignment unit. When light emits from the liquid crystal layer toward the color filter layer, the color unit can filter partial beams to allow the specific wave length beams to penetrate.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a side view of a traditional display panel;

FIG. **2***a* shows an explosive view of the embodiment of the display panel;

FIG. **2***b* shows a side view of the embodiment of the display panel;

FIG. **2***c* shows a side view of another embodiment of display panel;

FIG. **3** shows a side view of another embodiment of the first alignment unit and the second alignment unit;

FIG. **4** shows a side view of the embodiment of the first alignment unit and the second alignment unit;

FIG. **5** shows a side view of another embodiment of the first alignment unit and the second alignment unit;

FIG. **6***a* shows a top view of the embodiment of the first alignment unit and the second alignment unit;

FIG. **6***b* and **6***c* show a top view of another embodiment of the first alignment unit and the second alignment unit;

FIG. **7** shows a side view of the embodiment including the third alignment unit;

FIG. **8** shows a side view of the embodiment including color filter substrate;

FIG. **9** shows a side view of the embodiment of color filter layer disposition; and

FIG. **10** shows a side view of the embodiment of color filter layer disposed on the pixel electrode.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides a color filter substrate and a display panel having thereof. In the embodiment, the display panel includes a liquid crystal display panel. The liquid crystal display (LCD) panel preferably includes transmissive LCD panel, reflective LCD panel, transflective LCD panel and other types of LCD panel. Besides, in this embodiment, color filter substrate is a substrate disposed on a displaying side of the display panel. However, in other embodiment, color filter substrate can be a substrate disposed close to non-displaying side of the display panel.

In the embodiment shown in FIG. **2***a* and FIG. **2***b*, the display panel includes a first substrate **100**, an alignment structure set **300**, an upper electrode **310**, a second substrate **200**, a pixel electrode **500** and a liquid crystal layer **700**. In the embodiment, the first substrate **100** is disposed on the displaying side of the display panel while the second substrate **200** is disposed on the non-displaying side of the display panel. The first substrate **100** is disposed opposite to the second substrate **200**. The alignment structure set **300**, the pixel electrode **500** and liquid crystal layer **700** are accommodated between both of these substrates. The first substrate **100** and the second substrate **200** are made of transparent material, for example, such as glass, transparent plastic and so on. However, in other embodiment of the reflective LCD panel, the second substrate **200** can be made of non-transparent material.

In the embodiment shown in FIG. **2***b*, the alignment structure set **300** includes a first alignment unit **331** and a second alignment unit **332**. The upper electrode **310** is disposed on the first substrate **100**. In this embodiment, the upper electrode **310** is distributed on the first substrate **100** and faces to the second substrate **200**. The upper electrode **310** is preferably made of transparently conductive material such as ITO and so on. The first alignment unit **331** and the second alignment unit **332** are formed on the upper electrode **310**, respectively. Besides, the first alignment unit **331** is distinct from the second alignment unit **332**. For example, the first alignment unit **331** and the second alignment unit **332** are distinct among several factors, which include size, angle, structure, basic shape and so on. Furthermore, the first alignment unit **331** and the second alignment unit **332** may respectively have different contacting surface areas corresponding to the upper electrode **310**, different cross-sectional areas and so on. In this embodiment, the first alignment unit **331** and the second alignment unit **332** protrude away from the upper electrode **310** and the first substrate **100** to form the first cone and the second cone, respectively. In the embodiment shown in FIG. **2***b*, the size of the first alignment unit **331** and the second alignment unit **332** are distinct. Besides, both of the basal areas of these cones corresponding to the upper electrode **310** are different.

In the embodiment shown in FIG. **2***a* and FIG. **2***b*, a pixel electrode **500** is formed on the second substrate **200**. The pixel electrode **500** includes a first lower electrode **510** and a second lower electrode **520** which are connected in series. The first lower electrode **510** is disposed corresponding to the first alignment unit **331**. In the embodiment shown in FIG. **2***b*, the first lower electrode **510** is disposed under the first alignment unit **331**. The second lower electrode **520** is disposed corresponding to the second alignment unit **332**. In the embodiment shown in FIG. **2***b*, the second lower electrode **520** is disposed under the second alignment unit **332**. In this embodiment, the surface area of the first lower electrode **510** is smaller than the surface area of the second lower electrode **520**. Besides, the basal area of the first alignment unit **331** connecting to the upper electrode **310** is smaller than the basal area of the second alignment unit **332** connecting the same. The pixel electrode preferably includes a transmissive electrode, which is made of transparently conductive material such as ITO and so on. However, in the embodiment of the reflective LCD panel and the transflective LCD panel, the pixel electrode **500** can be reflective electrode and be made of non-transparently conductive material including several kinds of metals such as aluminum, silver and so on. Moreover, the first lower electrode **510** and the second electrode **520** can be formed as transmissive electrode and reflective electrode, respectively.

The liquid crystal layer **700** is accommodated between the upper electrode **310** and the pixel electrode **500**. By regulating the potential difference between the upper electrode **310** and the pixel electrode **500**, the conformation of the liquid crystal molecules in the liquid crystal layer **700** can be adjusted. In other words, the twisting angle of the liquid crystal molecules can be adjusted by modifying such potential difference. In the embodiment shown in FIG. **2***b*, because the surface areas of the first lower electrode **510** and the second lower electrode **520** in the pixel electrode **500** are different, the twisting angles of the liquid crystal molecules above the first lower electrode **510** and the second lower electrode **520** are different. Moreover, several different features such as structure, size and bevel angle between the first alignment unit **331** and the second alignment unit **332** would affect the conformation of these liquid crystal molecules. In the embodiment shown in FIG. **2***c*, by using the same surface areas of the first lower electrode **510** and the second lower electrode **520**, the different features, such as different sizes, between the first alignment unit **331** and the second alignment unit **332** can generate different twisting angles.

In the embodiment shown in FIG. **2***b*, the surface area of the first lower electrode **510** is small than the surface area of the second lower electrode **520**. Consequently, the first alignment unit **331** corresponding to the first lower electrode **510** could generate sufficient twisting-angle effect of the liquid crystal molecules above the first lower electrode **510**, even if the basal area of the first alignment unit **331** is smaller than that of the second alignment unit **332**. In this embodiment, because the first alignment unit **331** has the smaller basal area, the over-lapping area of the alignment unit on the first substrate **100** can be reduced. In other words, by using the first alignment unit **331** with smaller basal area, the aperture ratio of the whole system can increase and further augment luminosity and luminous efficiency. In the embodiment, the respective overlapping-area ranges of the first alignment unit **331** and the second alignment unit **332** to the first lower electrode **510** and the second lower electrode **520** are 5□ to 10□. However, the above-mentioned ranges can be adjusted depending on different design or demand. For example, the size of the first alignment unit **331** may be greater than that of the second alignment unit **332**.

In the embodiment shown in FIG. **3**, except for adjusting the basal areas and size (ex. volume) of the first alignment unit **331** and the second alignment unit **332**, the conformation of liquid crystal molecules can be adjusted by changing the bevel angle formed between the cone surface and the surface of the upper electrode **310**. Thus, the first alignment unit **331** and the second alignment unit **332** are different. In this embodiment, the first cone, i.e. the first alignment unit **331**, has a smaller bevel angle corresponding to the first lower electrode **510** and has a smaller basal surface area. In other words, the bevel angle of the first alignment unit **331** corresponding to the upper electrode **310** is smaller than the bevel angle of the second alignment unit **332** corresponding to the second lower electrode **520**. Besides, the bevel angle of the first alignment unit **331** can be reduced to shrink the basal area. Therefore, in the same alignment effect, this design obtains a larger aperture ratio.

In the embodiment shown in FIG. **3**, the first cone and the second cone, i.e. the first alignment unit **331** and the second alignment unit **332**, are preferably made of photo-resisting material and are formed on the upper electrode **310** by photo process and so on. The photo-resisting material includes transparent photo-resisting, gray photo-resisting and other types of photo-resisting material. However, in other embodiments, the first cone and the second cone can be formed by ink-jet process, deposition process, etching process and so on.

In the embodiment shown in FIG. **4**, the first alignment unit **331** and the second alignment unit **332** can be formed on the upper electrode **310** as a first cavity and a second cavity, respectively. The first cavity and the second cavity penetrate the upper electrode **310**, respectively. In the embodiment, the cross-sectional area of the first alignment unit/the first cavity **331** on the upper electrode **310** is smaller than the cross-sectional area of the second alignment unit/second cavity **332** on the upper electrode **310**. In the embodiment shown in FIG. **4**, the first alignment unit/the first cavity **331** with a smaller cross-sectional area is disposed corresponding to the first lower electrode **510** having a smaller surface area. Besides, the second alignment unit/the second cavity **332** is disposed corresponding to the second lower electrode **520** having a larger surface area. In other words, the size of the first alignment unit **331** is less than the size of the second alignment unit **332**, but not limited thereto. The size of the first alignment unit **331** may be greater than the size of the second alignment unit **332**. However, in other embodiments, when the cross-sectional area of the first alignment unit/the first cavity **331** is different from the cross-sectional area of the second alignment unit/second cavity **332**, both of the alignment units **331**, **332** can be disposed corresponding to the first lower electrode **510** and the second lower electrode **520** having the same surface area, respectively.

It is possible for the first alignment unit **331** and the second alignment unit **332** having distinct structures. In the embodiment shown in FIG. **5**, the first alignment unit **331** is a cavity formed on the upper electrode **310**, while the second alignment unit **332** is a cone formed on the upper electrode **310**. However, in other embodiments, the cone can be formed as the first alignment unit **331**, while the second alignment unit **332** is formed as a cavity. In the embodiment shown in FIG. **5**, the cross-sectional area of the first alignment unit **331** on the upper electrode **310** is smaller than the cross-sectional area of the second alignment unit **332** on the upper electrode **310**. However, except for the different cross-sectional areas, the conformation of the liquid crystal molecules can be adjusted by affecting the bevel angles of the first alignment unit **331** and the second alignment unit **332** or other method providing the same function.

In the embodiment shown in FIG. **6***a*, no matter what kinds of shapes these alignment units will be, the first alignment unit **331** and the second alignment unit **332** on the upper electrode **310** are preferably shaped in the circular cross-section. Besides, both of the alignment units **331**, **332** are disposed above the first lower electrode **510** and the second lower electrode **520**, respectively. When the first alignment unit **331** and the second alignment unit **332** are cones, the cross-sectional shapes are identical to the shapes of the basal areas. When the first alignment unit **331** and the second alignment unit **332** are cavities, the opening shapes and the basal shapes are identical to the aperture shapes of these cavities. In the embodiment, the circular cross-sectional area of the first alignment unit **331** is smaller than the circular cross-sectional area of the second alignment unit **332**.

In other embodiments, the cross-sectional shape of the first alignment unit **331** and the second alignment unit **332** on the upper electrode **310** can be respectively shaped in oval or other shapes. In the embodiment shown in FIG. **6***b*, the cross-sectional shape of the first alignment unit **331** on the upper electrode **310** is shaped in near-oval. Besides, the longitudinal axle **350** of the near-oval shape is preferably parallel to the longitudinal side **511** of the first lower electrode **510**. By this design, the horizontal distance between each side of the first lower electrode **510** and the first alignment unit **331** will have little discrepancy. In the embodiment shown in FIG. **6***b*, the direction of the longitudinal axle **350** is perpendicular to the connecting direction between the first alignment unit **331** and the second alignment unit **332**.

In another embodiment of the second alignment unit **332** shown in FIG. **6***c*, the cross-sectional shape of the second alignment unit **332** on the upper electrode **310** can be shaped in near-oval or circular. The longer axle **370** of the near-oval shape is preferably parallel to the longer side **521** of the second lower electrode **520**. By this design, the horizontal distance between each side of the second lower electrode **520** and the second alignment unit **332** will have little discrepancy. In this embodiment shown in FIG. **6***c*, the direction of the longer axle **370** is parallel to the connecting direction between the first alignment unit **331** and the second alignment unit **332**.

In the embodiment shown in FIG. **7**, the alignment structure set **300** further includes a third alignment unit **333**. The pixel electrode **500** includes a third lower electrode **530**. The third alignment unit **333** is preferably disposed for connecting with the first alignment unit **331** and the second alignment unit **332** in series. Besides, the third lower electrode **530** electrically connects with the first lower electrode **510** and the second lower electrode **520** in series. The third alignment unit **333** and the second alignment unit **332** are different. For example, both of the alignment units are distinct among several factors, which include size, angle, structure, basic shape and so on. Furthermore, the third alignment unit **333** and the second alignment unit **332** may respectively have different contacting surface areas corresponding to the upper electrode **310**, different cross-sectional areas and so on.

In the embodiment, the third alignment unit **333** and the second alignment unit **332** are formed as cones which protrude away from the upper electrode **310** and the first substrate **100**. In the embodiment shown in FIG. **7**, the volumes of the third alignment unit **333** and the second alignment unit **332** are different. Besides, the basal areas between both of the alignment units and upper electrode **310** are different. Moreover, in another embodiment, except for cones, the third alignment unit **333** could be formed as a cavity on the upper electrode **310**. In the embodiment shown in FIG. **7**, the cross-sectional shape of the third alignment unit **333** on the upper electrode **310** is shaped in near-oval. The direction of the longitudinal axle of the third alignment unit is perpendicular to the direction of the longitudinal axle of the first alignment unit **331**. However, in other embodiments, the cross-sectional shape of the third alignment unit **333** on the upper electrode **310** is shaped in circular or other shapes.

In the embodiment shown in FIG. **7**, the third alignment unit **530** is disposed under the third alignment unit **333**. In the embodiment, the preferred surface area of the third lower electrode **530** is larger than the surface area of the second lower electrode **520**. By this design, the twisting angles of the liquid crystal molecules above the first lower electrode **510**, the second lower electrode **520** and the third lower electrode **530** can be different. However, in other embodiment, through using the same surface areas of the second lower electrode **520** and the third lower electrode **530**, the twisting angles can be adjusted by different third alignment unit **333**. In the embodiment, the respective overlapping-area ranges of the third alignment unit **333** to the third lower electrode **530** are 5□ to 10□. However, the ranges can be adjusted depending on different design and demand.

In the embodiment shown in FIG. **8**, a color filter layer **600** is disposed on the first substrate **100** to form the first substrate **100** as a color filter substrate. The color filter layer **600** is preferably formed by coating process, etching process or other processes providing the same function. The color filter layer **600** is accommodated between the first substrate **100** and the alignment structure set **300** and has at least a color unit **610**. The color unit **610** is disposed corresponding to the first alignment unit **331** and the second alignment unit **332**, when the color unit **610** is disposed corresponding to the first lower electrode **510** and the second lower electrode **520**. In this embodiment, the color filter layer **600** preferably includes color units **310** having different colors. The colors of the color units **610** preferably include red, green, blue, white or other colors. When light from the liquid crystal layer **700** enters the color filter layer **600**, the color units **610** can filter partial light to allow certain light within specific wave length to penetrate.

In another embodiment of the color filter layer **600** shown in FIG. **9**, the color filter layer **600** is accommodated between the second substrate **200** and the pixel electrode **500** to filter light before the light arrives the liquid crystal layer **700**. The color unit **610** is disposed under the first lower electrode **510** and the second lower electrode **520** corresponding to the first alignment unit **331** and the second alignment unit **332**. In the embodiment shown in FIG. **10**, the color filter layer **600** can be formed on the pixel electrode **500** to accommodate the pixel electrode **500** between the color filter layer **600** and the second substrate **200**. The color unit **610** is formed on the first lower electrode **510** and the second lower electrode **520** corresponding to the first alignment unit **331** and the second alignment unit **332**, respectively. In the meantime, liquid crystal layer **700** is accommodated between the lower electrodes and the alignment units.

In the above-mentioned embodiments, the alignment structure surface and the surface of the pixel electrode are the surfaces which face to the liquid crystal layer. An alignment film is preferably disposed on these surfaces. The material of the alignment film includes polyimide resin for controlling the of liquid crystal alignment.

Although the preferred embodiments of the present invention have been described herein, the above description is merely illustrative. Further modification of the invention herein disclosed will occur to those skilled in the respective arts and all such modifications are deemed to be within the scope of the invention as defined by the appended claims.

What is claimed is:

1. A color filter substrate, comprising:

a substrate;

a color filter layer disposed on the substrate, wherein the color filter layer has at least one color unit; and

an alignment structure set including:

an upper electrode disposed on the color filter layer; and

a first alignment unit, a second alignment unit, and a third alignment unit, formed on the upper electrode and corresponding to at least one color unit, wherein the first alignment unit, the second alignment unit and the third alignment unit are distinct, the first alignment unit includes a first cone disposed on the upper electrode, the first cone is away from the color filter layer, and a basal shape of the first cone is shaped in near-oval or circular.

2. The color filter substrate of claim **1**, wherein the second alignment unit includes a second cone disposed on the upper electrode, and the second cone is away from the color filter layer, a basal area of the first cone is less than a basal area of the second cone, and a basal shape of the second cone is shaped in near-oval or circular.

3. The color filter substrate of claim **1**, wherein the second alignment unit includes a second cone disposed on the upper electrode, and the second cone is away from the color filter layer, and an bevel angle formed between a surface of the first cone and a surface of the upper electrode is less than an bevel angle formed between a surface of the second cone and a surface of the upper electrode.

4. The color filter substrate of claim **1**, wherein a size of the first alignment unit is less than a size of the second alignment unit.

5. The color filter substrate of claim **1**, wherein the second alignment unit and the third alignment unit are shaped in cone.

6. A color filter substrate, comprising:

a substrate;

a color filter layer disposed on the substrate, wherein the color filter layer has at least one color unit; and

an alignment structure set including:

an upper electrode disposed on the color filter layer; and

a first alignment unit, a second alignment unit, and a third alignment unit, formed on the upper electrode and corresponding to the at least one color unit, wherein the first alignment unit is distinct from the second alignment unit, and the third alignment unit and the first alignment unit are distinct; the first alignment unit includes a first cavity, and the second alignment unit and the third alignment unit are shaped in cone.

7. The color filter substrate of claim **6**, wherein an opening shape and a basal shape of the first cavity is shaped in near-oval or circular.

8. The color filter substrate of claim **6**, wherein the second alignment unit includes a second cavity formed on the upper electrode, and the cross-sectional area of the first cavity on the upper electrode is less than the cross-sectional area of the second cavity on the same.

9. The color filter substrate of claim **8**, wherein an opening shape and a basal shape of the second cavity on the upper electrode is shaped in near-oval or circular.

10. The color filter substrate of claim **6**, wherein the second alignment units includes a cone formed on the upper electrode, the cone is disposed on the upper electrode and protrudes away from the color filter layer.

11. The color filter substrate of claim **6**, wherein a size of the first alignment unit is less than a size of the second alignment unit.

12. A color filter substrate, comprising:

a substrate;

a color filter layer disposed on the substrate, wherein the color filter layer has at least one color unit; and

an alignment structure set including:

an upper electrode disposed on the color filter layer; and

a first alignment unit, a second alignment unit, and a third alignment unit, formed on the upper electrode and corresponding to the at least one color unit, wherein the first alignment unit, the second alignment unit, and the third alignment unit are distinct; the first alignment unit includes a first cavity.

13. A display panel, comprising:

a first substrate;

an alignment structure set including:

an upper electrode, disposed on the first substrate; and

a first alignment unit, a second alignment unit, and a third alignment unit, all formed on the upper electrode, wherein the first alignment unit is distinct from the second alignment unit, and the third alignment unit is distinct from the first alignment unit, wherein the first alignment unit includes a first cone, disposed on the upper electrode and protruding away from the first substrate, and wherein a basal shape of the first cone is shaped in near-oval, a longitudinal axle of the near-oval shape is parallel to a longitudinal side of the first lower electrode;

a second substrate;

a pixel electrode formed on the second substrate, wherein the pixel electrode has a first lower electrode, a second lower electrode, and a third lower electrode, the first lower electrode, the second lower electrode, and the third lower electrode are respectively disposed in opposition to the first alignment unit, the second alignment unit, and the third alignment unit, and a surface area of the first lower electrode is different from a surface area of the second lower electrode; and

a liquid crystal layer, disposed between the upper electrode and the pixel electrode.

14. The display panel of claim **13**, wherein the second alignment unit includes a second cone disposed on the upper electrode and protruding away from a color filter layer, and an bevel angle formed between a surface of the first cone and a surface of the upper electrode is less than an bevel angle formed between a surface of the second cone and a surface of the upper electrode.

15. The display panel of claim **13**, wherein a size of the first alignment unit is less than that of the second alignment unit, and a surface area of the first lower electrode is less than that of the second lower electrode.

16. A display panel, comprising:

a first substrate;

an alignment structure set including:

an upper electrode, disposed on the first substrate; and

a first alignment unit, a second alignment unit, and a third alignment unit, all formed on the upper electrode, wherein the first alignment unit is distinct from the second alignment unit, and the third alignment unit is distinct from the first alignment unit, wherein the first alignment unit includes a first cone, disposed on the upper electrode and protruding away from the first substrate;

a second substrate;

a pixel electrode formed on the second substrate, wherein the pixel electrode has a first lower electrode, a second lower electrode, and a third lower electrode, the first lower electrode, the second lower electrode, and the third lower electrode are respectively disposed in opposition to the first alignment unit, the second alignment unit, and the third alignment unit, and a surface area of the first lower electrode is different from a surface area of the second lower electrode; and

a liquid crystal layer, disposed between the upper electrode and the pixel electrode, wherein the second alignment unit includes a second cone, disposed on the upper electrode and protruding away from a color filter layer, the basal area of the first cone is less than the basal area of the second cone, a basal shape of the second cone is shaped in near-oval, and a longitudinal axle of the near-oval shape is parallel to a longitudinal side of the second lower electrode.

17. A display panel, comprising:

a first substrate;

an alignment structure set including:

an upper electrode, disposed on the first substrate; and

a first alignment unit, a second alignment unit, and a third alignment unit, all formed on the upper electrode, wherein the first alignment unit is distinct from the second alignment unit, and the third alignment unit is distinct from the first alignment unit;

a second substrate;

a pixel electrode formed on the second substrate, wherein the pixel electrode has a first lower electrode, a second lower electrode, and a third lower electrode, the first lower electrode, the second lower electrode, and the third lower electrode are respectively disposed in opposition to the first alignment unit, the second alignment unit, and the third alignment unit, and a surface area of the first lower electrode is different from a surface area of the second lower electrode, wherein a size of the first alignment unit is greater than that of the second alignment unit, and a surface area of the first lower electrode is less than that of the second lower electrode; and

a liquid crystal layer, disposed between the upper electrode and the pixel electrode.

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